PART 1 GENERAL

1.1 DESCRIPTION

.1 The Contractor shall furnish all labour, materials, tools, supervision, transportation, and equipment necessary to install well field and buried control plant HDPE pipe, accessories, appurtenances and connections as shown on the Drawings and specified herein.

1.2 SECTION INCLUDES

.1 Subheader Pipe.

.2 Lateral Pipe.

.3 Hydrostatic Pressure Testing.

.4 Warning Tape.

.5 Tracer Wire.

.6 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 31 23 10 – Excavating and Trenching

.2 Section 31 23 33.02 – Fill

1.4 REFERENCE STANDARDS

.1 Section 01 42 19 – Reference Standards.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A536 – Standard Specification for Ductile Iron Castings.

.2 ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

.3 ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

.4 ASTM D2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

.5 ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

.6 ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.7 ASTM D4976-00b – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

.8 ASTM D3350-00 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.9 ASTM F405 – Standard Specification for Corrugated Polyethylene Tubing and Fittings.

.10 ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.11 ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDRPR) Based on Outside Diameter.

.12 ASTM F2306 – Standard Specification for 12 to 60 in. (300 to 1500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.

.3 American National Standards Institute (ANSI):

.1 ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

.2 ANSI B18.2.1 – Square and Hex Bolts, and Lag Screws (Inch Series)

.4 Canadian Standards Association (CSA):

.1 CSA B1373.3 – Rigid Polyvinyl Chloride Pipe.

.2 CSA B182.8-02 – Profile Polyethylene Storm Sewer and Drainage Pipe and Fittings.

.3 CSA G401 – Corrugated Steel Pipe Products.

1.5 DEFINITIONS

.1 CSP: Corrugated Steel Pipe

.2 HDPE: High Density Polyethylene

.3 LFG: Landfill Gas

.4 SMDD: Standard Maximum Dry Density and in the context of this Contract means maximum dry unit weight determined in accordance with ASTM D698

.5 DR: Dimension Ratio. Actual outside pipe diameter divided by the wall thickness

1.6 PROGRESS SUBMITTALS

.1 Submit in accordance to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Piping and fitting dimensions including test reports and material property sheets.

.3 Manufacturer's Certificate: Quality control certificates pertaining to each lot of pipe produced.

.4 Manufacturer's Instructions: Indicate special procedures required to install products specified.

1.7 QUALITY ASSURANCE

.1 HDPE Pipe

.1 Pipe Resin: ASTM D1248 for material indicating a Type 3, Category 5, Class C, Grade P4710 (ASTM D3350 Cell Classification 3453C).

.2 Raw Material: Containing a minimum 2 percent carbon black, well dispersed by recompounding to protect the pipe from degradation by ultraviolet light.

.3 Pipe shall not contain any recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material supplier.

.4 Pipe Sizes: ASTM F714. Pipe sizes are specified in metric units; however, equivalent IPS pipe sizes shall be used to avoid fitting problems.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00 – Common Product Requirements: Product delivery, storage, and handling requirements.

.2 Deliver and store piping with labeling in place.

.3 Deliver, store, and handle pipe in accordance with applicable requirements of the specified references, the manufacturer's instructions, and as specified herein.

.4 Contractor is responsible for conducting an inspection at the time of delivery to verify that the correct products and the expected quantities are received. Pipes and accessories should be visually inspected for damage such as cuts, gouges, delamination, bulges, flat areas and ovality that may have occurred during shipment.

.5 Use every precaution to prevent damage to the pipe. Do not permit metal tools or heavy objects to unnecessarily come in contact with the pipe.

.6 All pipe shall be lifted off trailer such that any damage while unloading is avoided.

.7 Contractor is responsible for each pipe shipment to ensure that there has been no loss or damage.

.8 Pipe shall be stored on level surfaces to avoid deformation. Supports shall be spaced to prevent bending and deformation to the ends of the pipe. When stacked, the weight of upper units shall not cause deformation to pipe in the lower units.

PART 2 PRODUCTS

2.1 SUBHEADER PIPE

.1 HDPE Pipe: DR 17, 150 mm diameter.

.2 Bedding Sand: See Section 31 23 33.02 – Fill.

.3 Accessories:

.1 Joints: Thermal butt fusion except flanged and electrofusion connections.

.2 Flanges: ASTM A536 ductile iron backing flanges with Class 150 ANSI B 16.5 standard drilling and corrosion resistant coatings. Complete with 1-piece molded polyethylene stub ends and stainless steel bolt sets, unless otherwise indicated on drawings. Connections shall have same or greater pressure rating as pipes.

.3 Gaskets: Neoprene, minimum 3.2 mm thick.

.4 Bolt Sets: Hexagonal type 304 Stainless steel unless otherwise indicated in Drawings.

.5 Fittings: DR 17 Tee connections, Wye connections, and reducers.

.6 Electrofusion Couplers: DR 11.

.7 Blind Flanges: SCH 80 PVC.

.8 Warning Tape: See Article 2.11.

.9 Tracer Wire: See Article 2.12.

2.2 LATERAL PIPE

.1 HDPE Pipe: DR 17, 100 mm diameter.

.2 Bedding Sand: See Section 31 23 33.02 – Fill.

.3 Accessories:

.1 Joints: Thermal butt fusion except flanged connections.

.2 Flanges: ASTM A536 ductile iron backing flanges with Class 150 ANSI B 16.5 standard drilling and corrosion resistant coatings. Complete with 1-piece molded polyethylene stub ends and stainless steel bolt sets, unless otherwise indicated on drawings. Connections shall have same or greater pressure rating as pipes.

.3 Gaskets: Neoprene, minimum 3.2 mm thick.

.4 Bolt Sets: Hexagonal type, 304 Stainless steel unless otherwise indicated in Drawings.

.5 Fittings: DR 17 Tee connections, Wye connections and reducers.

.6 Long Sweep Elbow: DR 17 90 degrees, 5 section elbow.

.7 Warning Tape: See Article 2.11.

.8 Tracer Wire: See Article 2.12.

2.3 WARNING TAPE

.1 Standard, 4-mil polyethylene 76 mm (3 inch) wide tape, detectable type, blue with black letters, and imprinted with “BURIED GAS LINE BELOW”. Tape shall be installed as shown on Drawings.

2.4 TRACER WIRE

.1 TWU No. 12 Gauge Solid Copper Wire: 3.2 mm diameter.

.2 Minimum Roll Length: 300 m.

.3 Wire Connectors: 3M DBR watertight connectors for No. 12 gauge wire or approved equivalent.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Section 01 73 00 – Execution: Verification of existing conditions before starting work.

.2 Verify that excavation foundation is ready to receive work and excavations, dimensions, and elevations are as shown on the Drawings.

.3 Verify items provided by other Sections are properly sized and located.

3.2 PREPARATION

.1 Excavate to grades as shown on drawings, as per Section 31 23 10.

.2 Pipe shall be inspected for cuts, scratches, or other damages prior to installation. Any pipe showing damage which in the opinion of the Engineer will affect the performance of the pipe must be removed from the site. Replace any materials found to be defective.

.3 Hand trim excavations to required elevations.

.4 Ensure that the excavation remains dry and groundwater elevation remains below the base excavation elevation until adequate backfill is placed to ensure that the installed pipe will not be dislodged.

.5 Ensure that excavation foundation is suitable for pipe bedding placement. Excavation foundation should be free of large stones, clumps of soil, frozen soil and debris.

.6 Trench width shall be sufficiently wide to allow compaction of pipe bedding in the haunches and adjacent to the sides of the pipe.

.7 Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

.8 Unsuitable materials and waste excavated from trench alignments shall be disposed of on-site as directed by Engineer.

3.3 PIPE INSTALLATION

.1 Prevent debris and water from entering inside of pipe.

.2 Do not bend in a radius smaller than recommended by Manufacturer when staged on Site or installed in the trench.

.3 Perform thermal fusion in sheltered areas with temperature maintained in accordance with Manufacturer’s instructions.

.4 Avoid excess transportation and possible damage to the pipe.

.5 Prior to thermal fusion in the field on any pipe on a given date, provide a test weld and operating data to Engineer including welding temperature, machine number, date of last service, and clearance certificate.

.6 Install pipe, fittings, and accessories in accordance with Manufacturer’s instructions.

.7 Lay pipe to slope gradients as shown on Drawings with maximum variation from true slope of 1 cm in 3 m. Maintain positive drainage for all pipe sections.

.8 Use laser equipment for controlling grade of pipe installation.

.9 Fasten tracer wire to pipe and risers.

.10 Backfill to lines and grades indicated on Drawings.

.11 Place buried pipe tape as shown on Drawings.

.12 The Contractor shall stockpile all excavated materials not used for backfilling or cover soil on site as directed by Engineer.

.13 Soil used for backfill shall be placed in a loose lift that results in a compacted lift thickness of no greater than 150 mm (6 inches). The maximum permissible pre-compaction soil clod size is 150 mm.

.14 Surplus waste excavated from trenches shall be hauled to the landfill active area.

3.4 THERMAL WELDING PIPE

.1 All pipe fusion shall be performed by a supplier or a factory supplied and/or certified fusion operator.

.2 Join the polyethylene pipe by the method of thermal butt fusion, outlined in ASTM D 2657, or saddle fusion, depending on the type of joint. Of particular importance is the use of proper interface pressures and heater plate temperatures.

.3 Pipe cuts shall be square and perpendicular to the centerline of the pipe for butt fusion joints.

.4 Do not perform pipe fusion in water or when trench conditions are unsuitable for the work. Keep water out of the trench until joining is complete. Secure open ends of pipe and close valves when work is not in progress, so that no trench water, earth, or other substance will enter the pipe or fittings. Plug, cap or valve pipe ends left for future connection.

.5 In order to allow the joining operation to continue in adverse weather conditions, a shelter may be required for the joining machine. Particular caution should be exercised to prevent water from entering the pipe and from coming in contact with the heater plate and electrical connections. All electric lines used in field operations shall be fitted with ground fault current interrupters (GFCI).

.6 Only fully-trained personnel will be allowed to perform the installation, supervision, or inspection of polyethylene-fusion joints.

3.5 FIELD QUALITY CONTROL

.1 Section 01 45 00 – Quality Control: Field inspection and testing.

.2 Request inspection prior to placing aggregate cover over pipe.

.3 Hydrostatic Pressure and Leakage Test for header, sub-header, lateral pipes, genset connection and flare condensate line. Test as follows:

- .1 Provide labor, equipment, and materials required to perform hydrostatic and leakage tests herein specified; notify Engineer at least 24 hours in advance of all proposed tests; perform tests in the presence of Engineer.
- .2 Test at one time as much of the piping system as practical and authorized by Engineer.
- .3 Test all well field pipework at a pressure rating of 30 kPa. Utilize air or nitrogen to charge the pipelines and maintain pressure for adequate period to allow for expansion of the piping. Fittings, valves, and expansion joints shall be accessible for inspection during the pressure test. A pressure test will be deemed successful if the designated pressure is maintained for a period of not less than 1 hour with no measurable pressure drop during the term of the test. The temperature must be

constant to within 1 degree C during this period or adjusted with the appropriate correction factor.

.4 Cap and seal testing ports at the termination of the pressure test.

.5 Examine joints for leakage and remove any joints showing leakage from the pipeline, rejoin and retest the system.

.6 Ensure that normal safety precautions are observed for exposed piping.

.7 Locate and repair defects if leakage occurs.

.8 Repeat test until pressure drop is within specified allowance for full length of pipe.

.4 If tests indicate that the Works do not meet specified requirements, remove Works, replace, and retest.

3.6 PROTECTION OF FINISHED WORKS

.1 Section 01 73 00 – Execution: Requirements for protecting installed work.

.2 Protect pipe and cover from damage or displacement prior to and during backfilling operations.

.3 Prevent debris from entering system.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 SUBHEADER PIPE

.1 Schedule of Prices Item No. 23 05 05/01.

.2 Measurement Basis: By the linear metre measured along the centerline of the pipe.

.3 Payment Basis: Unit price. Incudes excavation, transporting suitable materials to temporary stockpiles, temporary stockpiling, and hauling and disposal of waste, unsuitable material or excess excavated materials at the active landfill area; supply and install bedding sand, sub-header pipe, fittings and accessories, flanges, gaskets, bolt sets, warning tape, and tracer wire; hauling, placing, compacting of backfill, regrading to grades as shown in Drawings.

4.3 LATERAL PIPE

.1 Schedule of Prices Item No. 23 05 05/02.

.2 Measurement Basis: By the linear metre measured along the centerline of the pipe.

.3 Payment Basis: Unit price. Incudes excavation, transporting suitable materials to temporary stockpiles, temporary stockpiling, and hauling and disposal of waste, unsuitable material or excess excavated materials at the active landfill area; supply and install bedding sand, lateral pipe, long sweep elbows, fittings and accessories, flanges, gaskets, bolt sets, warning tape, and tracer wire; hauling, placing, compacting of backfill, regrading to grades as shown in Drawings.

4.4 HYDROSTATIC PRESSURE TESTING

.1 Schedule of Prices Item No. 23 05 05/03.

.2 Payment Basis: Lump Sum Price. Includes supply of equipment, materials and labour to undertake hydrostatic pressure testing of all well field pipeworks.

END OF SECTION